DOCUMENT RESUME

ED 215 769 PS 012 811

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TITLE The Adjustment of Maternal-Child Instruction According to Child's Age and Task.
PUB DATE Apr 81
NOTE 19p.; An earlier version of this paper was presented at the Annual Meeting of the Society for Research in Child Development (Boston, MA, April 2-5, 1981).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Age Differences; *Chronological Age; Classification; Communication Research; *Difficulty Level; Individual Instruction; *Learning Activities; *Mothers; Parent Child Relationship; Simulation; *Teaching Methods; *Young Children
IDENTIFIERS *Parent Behavior

ABSTRACT

Modification of mother-child instructional interaction was examined in relation to specific tasks and the age of the child. Thirty-two mothers taught their 6- or 8-year-old children one of two laboratory classification tasks resembling a home or a school activity. The home task involved putting grocery items on shelves in a mock kitchen, and the school task involved sorting photographs of common objects into a tray divided into brightly colored compartments. It was expected that mothers would compensate for the perceived difficulty of the school task for the younger children by providing greater instructional assistance to this group than to the other three groups (older children in either task and younger children in the home task). The instructional interaction was coded in terms of number of directives, open-ended questions, and nonverbal instruction provided by the mother; involvement of the child; and the extent to which mothers rehearsed their children in preparation for the learning test which followed the instruction (the children were tested on their learning of the organization of items in the tasks). Multivariate analysis showed that the younger children in the school task received more instruction than either group of older children or the younger children in the home task. Univariate analysis showed this pattern to be significant for almost all of the instructional variables. This modification of instruction was accompanied by a slightly better performance on the learning task by the younger children in the school task than by children in the other three groups. (Author/MP)

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The Adjustment of Maternal-Child Instruction According to Child's Age and Task

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An earlier version of this paper was presented at the meetings of the Society for Research in Child Development, Boston, April 1981. We gratefully acknowledge the help of Ensign School children and their parents, Mr. Rulon Burningham, Mrs. Elda Rae Gunn, and the Ensign PTA. Thanks also to Nina Benson, Betsy Liller, and Kathryn Waddell for their assistance at various phases of the study. The research was supported by a grant from the University of Utah Research Fund. Requests for reprints should be sent to Barbara Rogoff, Department of Psychology, University of Utah, Salt Lake City, Utah 84122.

Running Head: Adjustment of Instruction

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Abstract

Modification of mother-child instructional interaction was examined in relation to task and child's age. Thirty-two mothers taught their 6- or 8-year-old children one of two laboratory classification tasks resembling a home or a school activity. It was expected that dyads would compensate for the perceived difficulty of the school task for the younger children by providing greater assistance to this group than to the other three groups (older children in either task and younger children in the home task). The instructional interaction was coded in terms of amount of directives, open-ended questions, and nonverbal instruction provided by the mother; involvement of the child; and reviewing for the learning test. Following the instruction, the children were tested on learning of the organization of items. Multivariate analysis showed that the younger children in the school task received more instruction than either group of older children or the younger children in the home task. Univariate analysis showed this pattern to be significant for almost all of the instructional variables. This modification of instruction was accompanied by slightly better performance on the learning task by the younger children in the school task than by children in the other three groups. The pattern of results focuses attention on the interactional nature of instruction and learning. Assistance with cognitive tasks is tailored to the perceived needs of the children in the particular problem context.

The Adjustment of Maternal-Child Instruction According to Child's Age and Task

The importance of social interaction for the development of a variety of cognitive skills is receiving increasing emphasis (Vygotsky, 1978; Wertsch, 1979; Wood, 1980). Wertsch, McNamee, McLane, and Budwig (1980) argue that before a child is able to function as an independent problem-solver, the responsibilities for planning, carrying out, and monitoring the strategies for reaching a goal are taken by adults in adult-child interactions.

Studies of the instructional strategies used by adults when teaching preschool children suggest that adults vary the kind and amount of instructional support they provide depending on the age and expertise of the learner (Bellinger, 1979; Bridges, 1979; Ervin-Tripp, 1978; Wertsch et al., 1980). Older preschoolers appear to be instructed with fewer directives and nonverbal instructions than younger children, and seem to receive more open-ended verbal instruction. While previous research has concentrated on instructional interactions between adults and preschool children, the adjustments in instruction may be similar for older children differing in relative expertise in the particular task taught. Childs and Greenfield (in press) note such adjustments of instruction with increasing expertise in a sample of mothers teaching preadolescent girls to weave.

The present study examines modification of mother-child instruction as a function of age of learner in middle childhood (6 versus 8 years). Children of these ages span a critical period in terms of their familiarity with formal schooling. The younger group involves children who have only recently entered

school, while the older children are well into their school careers. Instruction and learning were compared on two tasks designed to simulate school and home activities.

These instructional contexts have been distinguished in terms similar to those used in comparisons of age differences in instruction. It has been argued that school instruction relies more on language to transmit information which is removed from the context of its use, while everyday (nonschool) instruction occurs largely through demonstration of skills and participation embedded in the context in which the information and skills are to be used (Bruner, Olver, & Greenfield, 1966; Greenfield & Lave, 1982; Rogoff, in press; Scribner & Cole, 1973). Greenfield and Lave (1982) also suggest that commands may be more prevalent in everyday than in school instruction.

The interaction between learner's age and task could produce one of two effects on the type and amount of instruction adults provide for children. Since some of the same instructional dimensions appear important in both the developmental and context of instruction literatures, the effect of age of learner and task might be additive. Thus, the greatest use of directives and nonverbal instruction would be expected in the home task with the younger children, while the most open-ended verbal instruction would occur in the school task with the older children.

An alternative hypothesis which considers the learner's experience with the two tasks leads to a different prediction: that mothers would adjust their instruction according to their perception of the child's need for assistance in the task. Children who vary in the extent of their experience with school and school-like tasks by virtue of their age might be expected to

perform differentially on school and nonschool tasks because of variation in their familiarity with each. Mothers may perceive the school tasks as posing the most difficulty for the younger children and consequently adjust their instruction such that the younger children receive more assistance (along all dimensions of instruction) in the school task than the older children who have had more school experience. The youngest children in the school task would also receive more assistance than children of either age in the home task, since both age groups are fairly familiar with chores at home. The learning of the younger children in the school task would be expected to benefit from such assistance.

In summary, the literature to date suggests that the effects of age and the nature of the task on adults' instruction may be additive. We argue that adults respond less to age and the nature of the task per se than to the relative expertise of older and younger children on different tasks. The task and age conditions in this study are such that the age difference is critical for children's expertise in the school task but not the home task. We examine these hypotheses through consideration of the interaction of age and task in adults' instruction and in the children's resultant learning.

Method

Subjects

Thirty-two dyads composed of middle class mothers and their children participated in the teaching tasks. The children were 6-7-year-olds (mean age = 6.8 years, range = 6.1 to 7.9 years) and 8-9-year-olds (mean age = 8.9 years, range = 8.0 to 9.6 years). There were an equal number of boys and girls of each age.

Tasks and materials

Each dyad participated in one of two classification tasks resembling home and school activities. The home task involved putting grocery items on shelves in a mock kitchen; the school task involved sorting photographs of common objects into a divided tray. In both tasks the mother taught the location of 18 items which were grouped into 6 categories. In the test of learner's performance the child sorted 8 of the items used in the teaching interaction and 12 new items. The new items were introduced to test generalization and could be grouped in the original categories. Both tasks took place in a room designed to look like a kitchen, with appliances and cupboards, kitchen curtains and decorations. Pretesting was conducted to determine that the items were familiar and that the two tasks were roughly of the same difficulty.

In the home task, actual grocery items were grouped into categories located on different cupboard shelves. The categories and items used in the teaching interaction were condiments (ketchup, pickles, olives); snacks (Doritos, crackers, cookies); sandwich spreads (margarine, honey, peanut butter); fruits (pineapples, peaches, applesauce); baking goods (cake mix, muffin mix, flour); and dry goods (macaroni mix, rice, taco shells).

In the school task, color photographs (8 1/2 cm by 6 1/2 cm) of common objects were spread in a tray divided into brightly colored compartments. The tray was on a table at one side of the "kitchen". The categories and photographs used in the teaching interaction were machines (popcorn popper, hair dryer, typewriter); cutting tools (scissors, paring knife, hand lawn mower); table settings (table knife, bowl, cup); hygiene articles (toothbrush,

razor, curlers); baking utensils (wooden spoon, mixer, measuring cup); and cleaning tools (broom, bucket, rubber gloves).

Procedure

The mother viewed the items (either groceries or photographs) in their locations until she felt she knew their organization, and was provided a cue sheet which illustrated the items in their locations for use when needed during the instructional phase. The mother was told to use whatever teaching method she liked, except revealing the cue sheet, to help the child learn the locations of the items. She was encouraged to teach as she would at home when organizing the kitchen after a shopping trip or when assisting her child on a homework problem. Both mother and child were informed that it was important for the child to know the organization of the items because after a short (5 min) delay the child would return to the kitchen to place some of the old items and some new items in their proper locations.

Coding of the instruction

The videotaped teaching interactions were coded by two graduate students (uninformed of the aims of the study) into the following categories which provided information about both verbal and nonverbal aspects of the instruction, the directiveness of the mother's verbal instructions, and the involvement of the child in the instruction.

Type of discourse. All task-relevant phrases in the mother's discourse were coded as either directives or open-ended questions. Phrases were defined as discourse not containing a pause which in written form would imply punctuation.

Directives are statements, commands, or tag questions which require the child only to follow instructions or to agree or disagree with a statement. For example, "It's a kind of machine;" "Find the fruits and put them together;" "I'm going to put these things in with the eating things, you think that's right?"

Open-ended questions require the child to respond (verbally or nonverbally) to a request for information or action which only minimally specifies the appropriate response. They require more than simple agreement. For example, "Which box does this go in?" "What is the muffin mix like?"

Nonverbal instruction. All informative gestures and the placement of target items by the mother were coded as nonverbal instruction. Gestures included discrete body movements conveying information about the items or locations (e.g., pointing, nodding, holding up an item). Placement was coded each time a target item was put on a shelf (home task) or in a compartment (school task), even if the same item was placed several times.

Child's involvement. The child's verbal and nonverbal contributions to the transmission of information were coded as the child's involvement. This included the child's verbal references to the name of an item or a category, to the physical locations, task requirements, or mnemonic strategies. It also included the child's informative gestures and placement of target items.

Reliability of coded variables

Reliability was computed for 16 videotaped interactions; 8 of the tapes were part of this study and 8 were of adult-child and child-child teaching interactions on identical tasks using the same coding system. Estimates computed from the 8 tapes used in this study showed the same pattern as that found in the larger pool, and the larger pool yields greater stability. Product moment correlations give the following reliability estimates: directives (.92), open-ended questions (.94), nonverbal instruction (.76), child's involvement (.91).

Reviewing for test

Every instructional interaction continued at least until all items were placed in their locations. Dyads varied, however, in the extent of explicit rehearsal which occurred following the placement of items. Explicit preparation for the upcoming test involved reviewing the material, rehearsing from memory, and quizzing the child. (Very little reviewing and quizzing on the information occurred before completion of item placement.) To evaluate the extent of explicit preparation for the test, we measured the time from the beginning of instruction to the completion of item placement, and the time from completion of item placement to the completion of reviewing, rehearsing, and quizzing. We then calculated the proportion of total time spent on explicit preparation for the test.

Test performance

Test performance is the number of items correctly placed in the test of learning and generalization. Maximum correct equals 20.

Results

Comparisons of effects of age of child and of task on instructional variables were made using univariate and multivariate analysis of variance. Some heterogeneity of variance was discovered, but examination of the degree of heterogeneity of variance for each variable suggested that it was unrelated to the significance of the univariate F values obtained. The data for boys and girls were combined, since the number in each condition was small.

Insert Table 1 about here

The mean values for the instructional variables and for performance on the learning test by the two ages in the two tasks appear in Table 1. Proportion of time reviewing is a ratio formed from two components--time sorting items and time reviewing. Since these components may be more interpretable individually than as a proportion, we present the two components as well as the proportion score.

Insert Table 2 about here

To determine support for the two alternate hypotheses, please examine the means for each variable (presented in Table 1) and the significance of main effects and interaction contrasts (presented in Table 2). The additive hypothesis predicted significant main effects for age of child and for task, with greater use of open-ended questions and less use of directives and nonverbal instruction with older relative to younger children, and in the

school task relative to the home task. The results show no significant main effect for age on maternal use of open-ended questions, directives, or nonverbal instruction. Task main effects for open-ended questions are significant and consistent with the hypothesis, but for nonverbal instruction and directives they are in the opposite direction from the hypothesis. These results do not seem to indicate support for the additive hypothesis.

Rather, the results support the alternate hypothesis, that the younger children in the school task would have more instruction than either group of older children or the younger children in the home task. To test this prediction, the five instructional variables (directives, open-ended questions, nonverbal instruction, child's involvement, and proportion of time reviewing) were included in a multivariate analysis of variance which contrasted the mean for the young children in the school task with the average of the means of the other three groups. This contrast resulted in a significant F value, F (5, 24) = 2.616, p = .05, which indicates that the pattern is reliable. Univariate analyses of each of the variables indicate which of the variables contribute to the pattern. Table 2 gives the contrast value for the interaction for each variable. The univariate analyses show that the amount of directives, open-ended questions, nonverbal instruction, child's involvement in the instruction, and time spent reviewing was greater for the younger children in the school task than for the younger children in the home task or for the older children in either task. The amount of time spent sorting items did not significantly follow the pattern.

Though test performance did not show a significant interaction paralleling that of the instructional variables, the highest performance was

achieved by the 6-7-year-olds in the school task (see Table 1). Their age-mates in the home task had the poorest performance. Using Bonferroni *t* procedures to cover the multiple comparison errors (Miller, 1966), the difference between the 6-7-year-olds' performances in the two tasks was significant (Bonferroni $t = 2.97$, $p < .02$, one-tailed), while the difference between 6-7-year-olds and 8-9-year-olds on the school task was nonsignificant. The comparison of learning in the various conditions is somewhat attenuated by ceiling effects. The 6-7-year-olds in the school task are most closely clustered near the ceiling, with seven out of eight of them missing no more than 2 items, and one missing 4 items. By contrast, only two 6-7-year-olds in the home task missed 2 items or less, and the others missed up to 17 items. Of the 8-9-year-old subjects, three children in the home task and five in the school task missed 2 items or less, and the remainder of them missed up to 14 and 8 items, respectively.

The differences between the 6-7-year-old learners in the two tasks have been replicated by the findings of Rogoff and Ellis (unpublished data) with another sample of 6-7-year-olds taught by women unrelated to them. In that sample, almost exactly the same values were obtained on all variables as for the 6-7-year-olds in this study (there were no significant differences between the two samples). Both samples showed the pattern of increased instruction in the school task compared to the home task. In addition, in both samples, the learning of the 6-7-year-olds in the school task was slightly greater than that of the 6-7-year-olds in the home task.

Discussion

The results show more intense instruction of all kinds for the younger children in the school task. It was our impression that a difference in attitude towards the two tasks underlies the observed differences in instruction. Subjects seemed to regard the school task as more difficult, and adopted a more formal stance toward it. This was most apparent with the child teachers reported by Ellis and Rogoff (in press). The 8-9-year-old teachers in the school task often adopted school teacher intonations in instructing their 6-7-year-old pupils (e.g., "Now where do you think this one goes?. . . No, try again . . . Ye-es! Very good! I bet you'll go to second grade next year!") This was very different from the child teachers' treatment of the kitchen task, in which they usually sorted the items without much attempt to involve the learner. The recollections of two brothers who each served as pilot subjects in one of the tasks illustrate the differing perspectives applied to the two versions of the task:

> "Remember how we put things on shelves in a kitchen?"
>
> "No, you put things on shelves; I put things in categories. Mine was more abstract!"

It appears that mother-child dyads adjusted instruction to provide support for the younger chidren in the task in which they are expected to be least expert--the school task. This adjustment was accompanied by slightly better performance on the learning test by the younger children in the school task. The pattern of results focuses attention on the interactional nature of instruction and learning: The performance of the younger children would ordinarily be expected to be poorer than that of the older children in both

tasks. However, with the dyads adjusting for the expected difficulty of the "harder" task for the younger children, somewhat better performance was achieved by the apparently less expert group.

This compensatory effect is mirrored in the findings of several other researchers investigating learning. Webb (1980) reports that when groups of students were told to help each other learn, students with high ability (according to aptitude and achievement tests) assisted students with low ability and ignored medium-ability students. The findings of more than 40 studies reviewed by Battig (1979) for solitary learners show that when faced with materials that are difficult but which nonetheless must be learned, subjects typically show delayed retention that is at least as good and often better than for easier materials.

While older children may be prepared to benefit more than younger children from identical learning experiences (Siegler, 1976), our results suggest that the natural ecology of child development compensates for children's differential readiness to learn specific material by adjusting learning experiences. Children of different ages may be unlikely to receive identical instructional experience, since adults tailor their assistance to the perceived needs of the children in the particular problem context.

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Table 1. Means (and standard deviations) for instructional variables and test performance.

	6-7 year-olds		8-9 year olds	
	Home Task	School Task	Home Task	School Task
Directives	66.2 (31.9)	97.4 (36.1)	59.6 (32.5)	69.0 (28.1)
Open-ended questions	9.6 (9.6)	20.5 (9.6)	9.2 (7.4)	10.8 (5.7)
Nonverbal instruction	28.0 (16.1)	59.4 (35.9)	27.8 (20.9)	38.2 (24.6)
Child's involvement	36.0 (16.6)	76.0 (38.1)	39.9 (16.7)	52.5 (28.9)
Proportion of time reviewing	.16 (.13)	.27 (.20)	.14 (.10)	.17 (.24)
Time placing items (sec)	268.4 (118.7)	373.8 (149.4)	264.0 (84.5)	360.9 (180.3)
Time reviewing (sec)	61.6 (73.4)	183.2 (168.2)	49.5 (49.9)	78.0 (116.0)
Test performance	14.2 (5.6)	18.5 (1.3)	15.9 (4.6)	17.0 (3.1)

Table 2. Main effects of age of learner and task, and univariate contrast values for instructional variables and test performance.

	Main Effects		Univariate Contrast
	Age of Child	Task	(df=28)
Directives		F = 3.15, p = .087	t = 2.46, p = .018
Open-ended questions	F = 3.01, p = .09	F = 4.49, p = .043	t = 3.08, p = .004
Nonverbal instruction		F = 5.40, p = .028	t = 2.70, p = .011
Child's involvement		F = 7.80, p = .009	t = 3.05, p = .004
Proportion of time reviewing			t = 1.60, p = .12
Time placing items (sec)		F = 4.30, p < .05	t = 1.36, p = .18
Time reviewing (sec)		F = 3.63, p = .07	t = 2.64, p = .013
Test performance		F = 3.62, p = .07	t = 1.71, p = .097